

Early Detection Monitoring for Quagga and Zebra Mussels in California



California Department of Fish and Wildlife monitors waterbodies and facilities throughout the state using one or more monitoring methods. Additional monitoring is conducted by other state and federal agencies, water districts, and power companies. CDFW maintains a statewide database of all known monitoring activities.

The following methods, or a combination thereof, are used to monitor for quagga and zebra mussels throughout the state. When designing a program the method(s) and frequency of monitoring should be selected based on the type of water, accessibility to it, and availability of equipment and personnel.

Surface Surveys

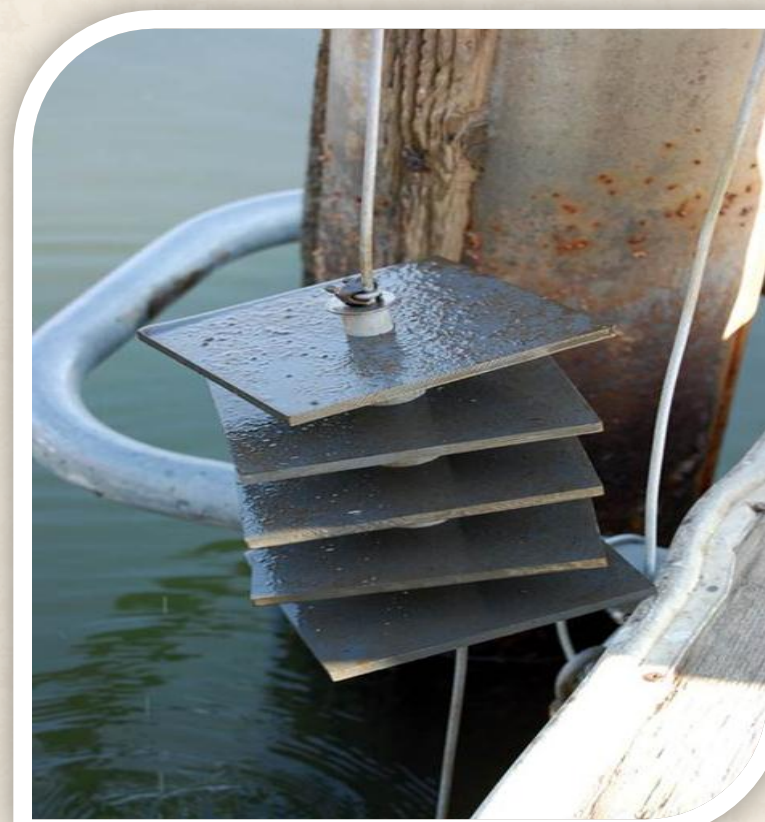
This method requires no special equipment. Mussels are detected by running fingers over existing surfaces. Juvenile mussels feel gritty and “seed-like” or “pebble-like” to the touch. Adult mussels can be visually identified. Efforts should focus on dark substrates and low light areas, which are preferred by quagga and zebra mussels. Snorkel or scuba diving may be used to examine submerged surfaces. Areas to monitor include the underside of docks, buoys, mooring lines, cables, rocks, concrete, logs, driftwood, vegetation, and anything that has been submerged. Surface surveys should be conducted monthly.



Surface survey inspection of dock rope

Artificial Substrates

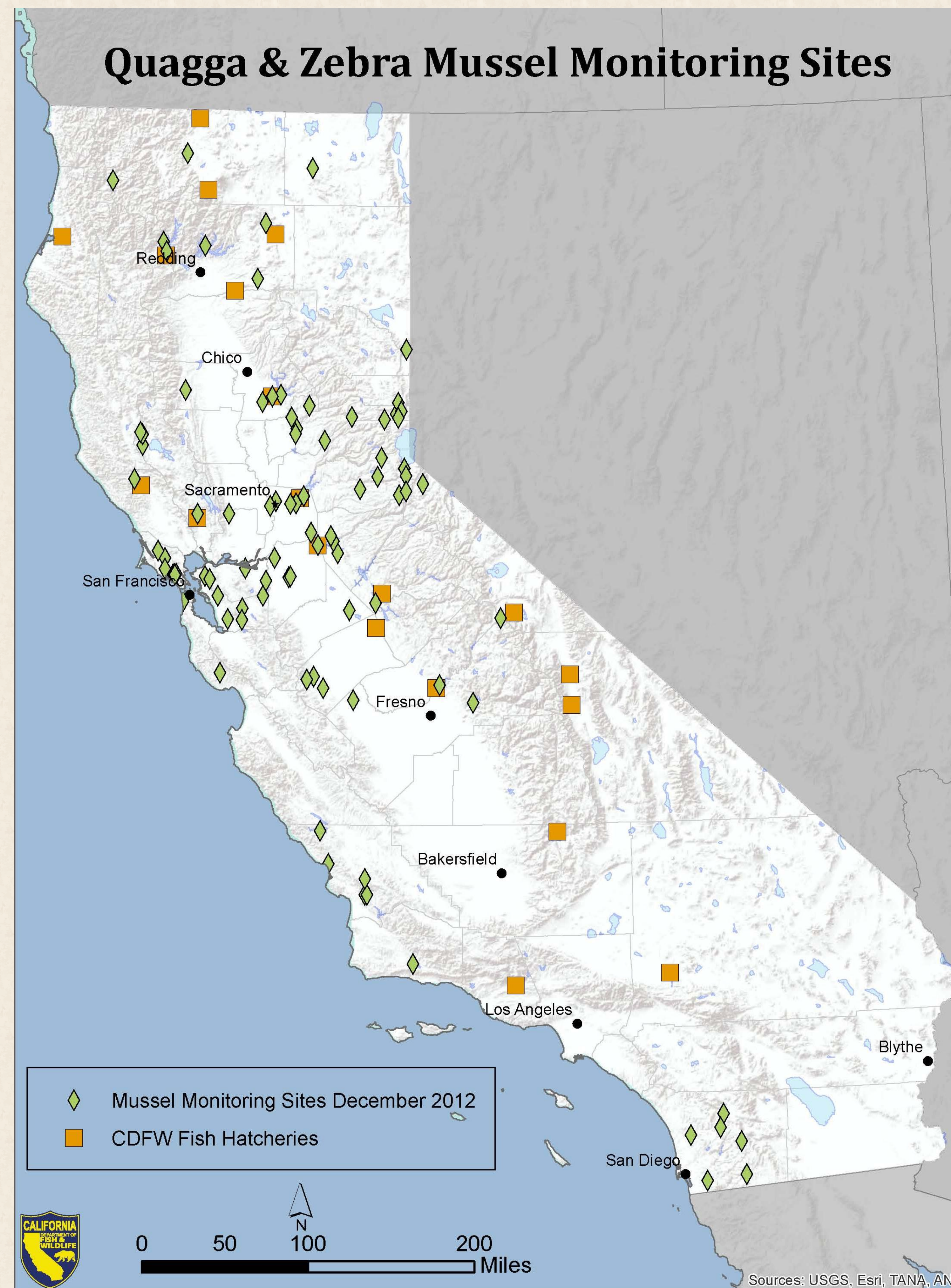
This method can be used in areas with an absence of existing surfaces and in open water. This method is relatively inexpensive and requires minimal equipment. Artificial substrates can be constructed from a variety of materials, but minimally should include rough surfaces and be deployed in areas with low light (at water depths below where light penetrates), and low water flow. Substrates should be inspected monthly by visual and tactile examination as described for surface surveys. Areas to monitor include around boat ramps, gas docks, marinas, and open water.



Artificial substrate before deployment



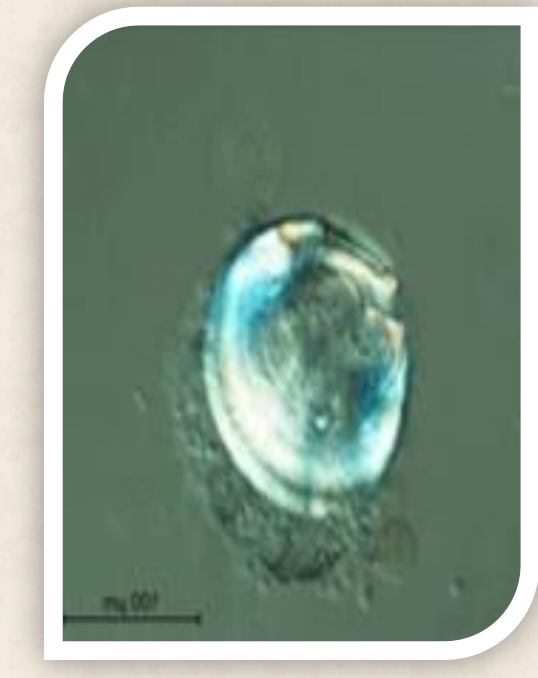
Artificial substrate after deployment with mussels attached



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Plankton Sampling

This method requires specialized equipment, and is relatively expensive and labor intensive. The benefit of this method is that it can detect microscopic mussel larvae, thus may allow for the detection of mussels before they are widespread in a waterbody. Nets are used to collect plankton samples by lowering the net into the water and then pulling the net back up at a steady rate. This is repeated several times. Samples are placed into labeled plastic bottles, stored on ice, and sent to a laboratory for analysis. Areas to sample include open water, near boat ramps, near water inflows and outflows, and downwind areas. The frequency of plankton tow sampling can vary with spawning seasons and availability of resources.



Quagga veliger larva



CDFW scientist performing a plankton tow

Bioboxes

Bioboxes are flow-through aquaria designed to monitor for settling juvenile mussels in facilities. They are typically plumbed into the water inflow and/or outflow. The cost of this method is moderate, and should be used along with another monitoring method. Biobox design can vary, but must have a minimum internal volume of 12 gallons and a flow rate of 1.32 gallons/minute to optimize juvenile mussel settlement. Bioboxes are inspected by closing the inflow valve and examining the internal surfaces as described for surface surveys. After inspection the valve is opened to resume flow. Bioboxes should be inspected monthly.



Inside surface of biobox



Plumbed biobox